

vi. Luminosity Monitor - Zero Degree Calorimeter

Each interaction region with a Heavy Ion Experiment will have Zero Degree Calorimeters (ZDC) installed at 18 m upstream and 18 m downstream from the interaction point along the beam axis. The calorimeters are mounted on platforms supporting them between the beam pipes in the warm section from the DX magnet to the D0 magnet.

Each calorimeter will intercept a number of beam-energy neutrons (typically 5 - 10 for central Au-Au beam collisions and ~ 1 for mutual Coulomb dissociation "very peripheral" collisions). Coincidences between calorimeters in each beam direction will be recorded if each has a pulse height $\geq 60\%$ of one beam-energy neutron. This coincidence corresponds to an effective cross section of 11 barns and will provide a luminosity monitor with a calibration uncertainty expected to be $\pm 5\%$. The coincidence signal will be made available to the RHIC control room for tuning purposes and will be used by the experimenters for luminosity normalization.

Responsibility for the calorimeters is shared between the RHIC Accelerator Physics (RAP) group and the individual experiments. The experimental groups will construct and maintain the calorimeters, calibrate them, and will provide coincidence signals for rate measurements. RAP will provide the VME based scalers, HV supplies, and application code for HV adjustment and scaler-based luminosity and background calculations.

Each ZDC is constructed from 3 two-interaction length modules of tungsten plates (5 mm thick) and fiber ribbons (0.5 mm thick) with 27 layers per module. The modules are 11 cm wide and 58 cm high as shown in Fig. 8-1. The total calorimeter length is 70 cm.

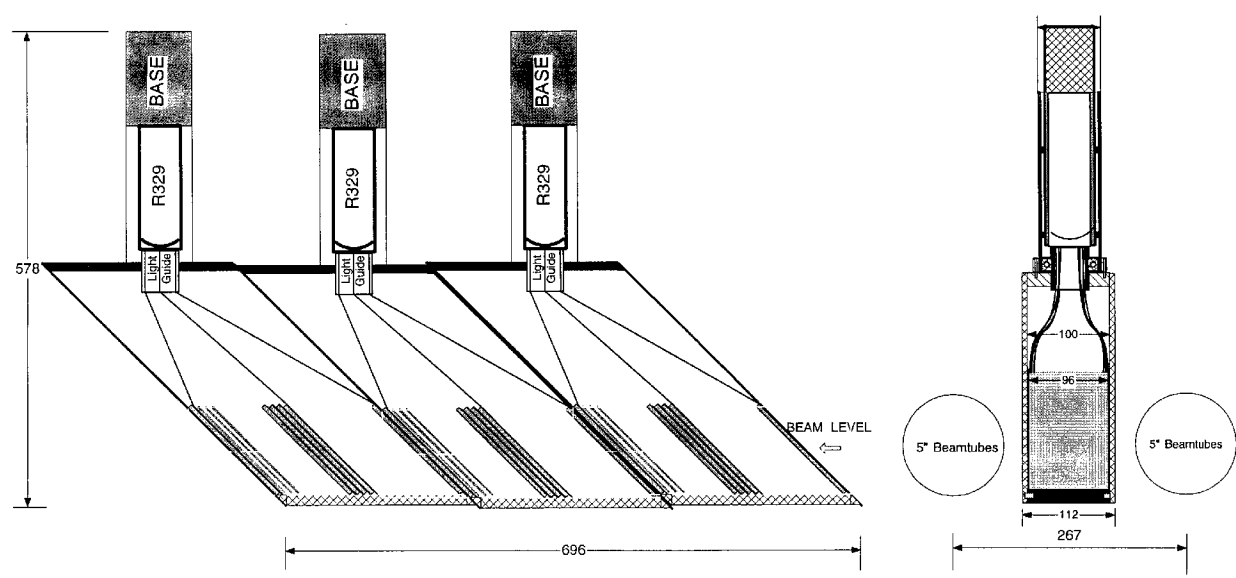


Fig. 8-1. Sketch of Zero Degree Calorimeter (dimensions are in mm).